BEHAVIOUR OF CONCRETE BEAM REINFORCED WITH KENAF FIBER MAT (KFM)

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ABSTRACT

There are many researches on external strengthening on the beam using Kenaf Fiber Composite Plate (KFCP) to replace the Carbon Fiber Composite Plate (CFCP) in order to achieve sustainability. This research has been conducted to determine the potential use of kenaf fiber mat (KFM) as reinforcement in beams. The kenaf fibers were treated with 6% of sodium hydroxide (NaOH). The treated kenaf fiber and untreated kenaf fiber samples were prepared for single fiber test. The fiber content considered in this study was 15%, 20%, 25% and 30%. KFM samples for tensile test and flexural test were prepared with respect to the fiber volume ratio. The KFM samples will be undergoing tensile test and flexural test. In this study, a total of 6 beams was examined, which included 2 control beams (without reinforcement), 2 singly reinforced concrete (RC) beams using 2 diameter 10 mm bars and the remaining beams were singly reinforced with KFM. All the beams were tested to failure under three-point loading test. From the tensile test results, KFM samples with 25% of fiber content showed the highest tensile strength at 40.2 N/mm^2. KFM with fiber volume ratio 25% exhibited highest flexural strength among the varying fiber volume ratio at 34.1 N/mm^2. For the three-point loading tests for beam, the results showed that the KFM beams had increased the ultimate load up to 35% compared to the control beam. Nevertheless, KFM beam only able to reach 31% of the ultimate strength of steel reinforced beam. In terms of crack pattern, similar cracks between the control beam and KFM beams were observed, which failed in bending. The cracking pattern for RC beam can be seen as failure in shear.

ABSTRAK

Penggunaan serat kenaf telah meningkatkan pembangunnan mesra alam dalam sektor industri pembinaan. Terdapat banyak kajian tentang menguatkan luar rasuk dengan Kenaf Fiber Composite Plate (KFCP) untuk menganti Carbon Fiber Composite Plate (CFCP) untuk mencapai kemampanan. Kajian ini telah dijalankan untuk menentukan potensi Kenaf Fiber Mat (KFM) yang digunakan sebagai tetulang dalam rasuk. Senat kenaf telah dirawat dengan 6% Sodium Hydroxide (NaOH). Senat kenaf yang dirawat and tidak dirawat spesimen telah disediakan untuk ujian senat tunggal. Kandungan serat yang akan dikaji dalam kajian ini adalah 15%, 20%, 25% dan 30%. Sampel KFM untuk ujian tegangan dan ujian lenturan telah disediakan dengan nisbah jumlah serat Sampel KFM akan menjalani ujian tegangan and ujian lenturan menggunakan Universal Testing Machine (UTM) 50 kN. Dalam kajian ini, sebanyak 6 rasuk telah diperiksa, termasuk 2 rasuk kawalan (tanpa tetulang), 2 konkrit bertetulang tunggal (RC) rasuk dengan menggunakan 2 diameter 10 mm batang besi dan baki rasuk telah tunggl diperkukuhkan dengan KFm. Semua rasuk telah diuji sampai gagal di bawah ujian 3 titik beban dengan menggunakan UTM 100 kN. Daripada ujian tegangan keputusan sampel KFm dengan 25% daripada kandungan serat kenaf menunjukkan kekuantan tegangan tertinggi pada 40.2 N/mm^2. KFM dengan nisbah jumlah serat 25% dipamerkan kekuatan lenturan tertinggi di kalangan nisbah jumlah yang berbeza dengan 34.1 N/mm^2. Seterusnya, bagi ujian 3 titik beban untuk rasuk, keputusan menunjek bahawa rasuk KFM telah meningkat beban muktamad sehingga 35% berbanding dengan rasuk kawalan. Walau bagaimanapun, KFM rasuk hanya dapat mencapai 31% daripada kekuatan muktamad RC rasuk. Dari segi corak retak, retak sama antara rasuk kawalan dan rasuk KFM diperhatikan, yang gagal dalam lenturan. Corak retak bagi rasuk RC boleh dilihat kegagalan ricih.